



**Calhoun: The NPS Institutional Archive**  
**DSpace Repository**

---

CRUSER (Consortium for Robotics and Unmanned Systems Education and Research) Faculty and Researchers' Publications

---

2018

# Network Enabled Digital Swarm Image Synthesis (NEDSIS) Phase 2

Pace, Phillip; Romero, Ric

Monterey, California: Naval Postgraduate School

---

<http://hdl.handle.net/10945/58140>

---

This publication is a work of the U.S. Government as defined in Title 17, United States Code, Section 101. Copyright protection is not available for this work in the United States.

*Downloaded from NPS Archive: Calhoun*



<http://www.nps.edu/library>

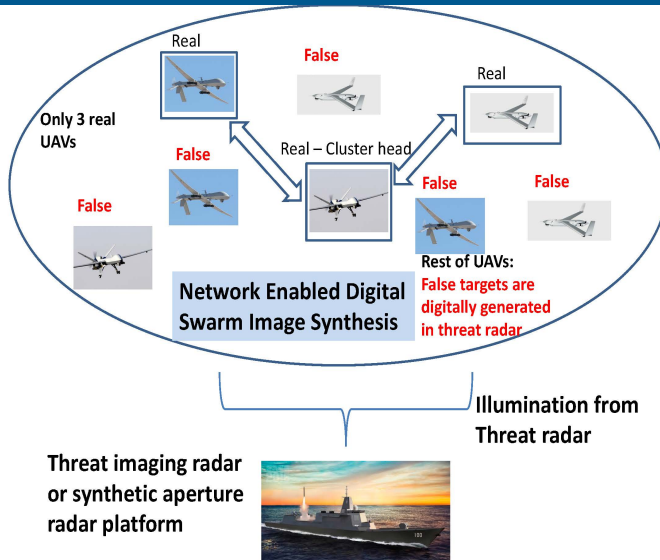
Calhoun is the Naval Postgraduate School's public access digital repository for research materials and institutional publications created by the NPS community. Calhoun is named for Professor of Mathematics Guy K. Calhoun, NPS's first appointed -- and published -- scholarly author.

**Dudley Knox Library / Naval Postgraduate School**  
**411 Dyer Road / 1 University Circle**  
**Monterey, California USA 93943**

# Network Enabled Digital Swarm Image Synthesis (NEDSIS) Phase 2



NAVAL  
POSTGRADUATE  
SCHOOL



Concept of generating false "swarm" against enemy radar

## Work and Solution Proposed

- **Proof of concept:** To implement NEDSIS, a proof-of-concept is needed. The ECE Sensor Group has the necessary equipment to show proof-of-concept.
- **FPGA based:** Most NEDSIS signal processing algorithms are implemented in field programmable gate array (FPGA) device, which is a very powerful, low weight, and low-cost solution.
- **Cost, Size, Weight and Power (CSWaP):** A FPGA may be reprogrammed at a later time for added capability. In addition baseband communication and networking needed to support NEDSIS may also be programmed into the FPGA thereby creating a multifunction chip for CSWaP.
- **Supporting Software and Hardware:** Existing work and codes (used to generate digital images) may apply to creating false swarms. The PIs have existing works/codes. PIs have access to inexpensive radars that can emulate "threat radars". PIs already have two Altera Stratix-V FPGA design boards.

## Background

- With adaptive electronic maneuver warfare (EMW) techniques, it has become difficult to perform conventional electronic attack (EA) such as frequency jamming on threat imaging radars.
- Due to payload and other practical requirements, the mission may be effectively served with a smaller group or swarm but made up of larger UAVs (instead of larger swarm but micro-UAVs)
- Threat platform may image the UAV network via radar.
- It is proposed to create false UAV swarm via a novel technique called network-enabled digital swarm image synthesis (NEDSIS) to counter the threat platforms.

## Value to the Fleet

- Electromagnetic (EM) spectrum is a resource. Moreover it is a terrain.
- Maneuver and deception techniques are key in this terrain.
- Network Enable Digital Swarm Image Synthesis is a deception technique that can be used a small network of UAVs.
- NEDSIS create a "false but much larger" swarm as imaged by threat radars.
- Obfuscates the scenario for the enemy.
- Protects the UAV network and help achieve mission.